DECLARATION

I, Shuichi Tomita, a professional translator, declare that to the best of my knowledge and belief the following is a true translation into the English language of the document, Japanese Patent Application No. JPAP10-258921 filed in the Japanese Patent Office on September 11, 1998.

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[Title of the Invention]

Plastic molding and method of molding same

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[List of the Document attached]

[Name of Document] Specification 1

[Name of Document] Drawing 1

[Name of Document] Abstract 1

[Name of Document] SPECIFICATION

[TITLE OF THE INVENTION]

PLASTIC MOLDING AND METHOD OF MOLDING SAME

[CLAIMS]

[Claim 1]

A plastic molding formed with a transfer surface by generating a resin pressure in a resin within a cavity of a mold having one or two transferred surfaces to transfer the transferred surface to said plastic molding, characterized by comprising:

an imperfect transfer portion formed in a concave shape or in a convex shape by imperfectly transferring the shape of the cavity of the mold into at least one or two or more regions prone to a resin internal pressure and an internal distortion.

[Claim 2]

A plastic molding according to claim 1, characterized in that said imperfect transfer portion is formed in a region other than said transfer surface.

[Claim 3]

A plastic molding according to claim 1 or 2, characterized in that said imperfect transfer portion is formed on a surface extended from said transfer surface.

[Claim 4]

A plastic molding according to claim 1 or 2, characterized in that said imperfect transfer portion has the edge formed conformal with a flat surface or a curved shape of said transfer surface.

[Claim 5]

A plastic molding according to claim 4, characterized by comprising two or more of said transfer surfaces, said imperfect transfer portions being formed in regions sandwiched by said transfer surfaces, said imperfect transfer portions having edges conformal to a flat surface and a curved shape of both said transfer surfaces.

[Claim 6]

A plastic molding according to any of claims 1 to 5, characterized in that said imperfect transfer portion is formed in a thinner region.

[Claim 7]

A plastic molding according to any of claims 1 to 6, characterized in that two or more of said imperfect transfer portions are formed on the same surface other than said transfer surface.

[Claim 8]

A plastic molding according to any of claims 1 to 7, characterized in that said plastic molding is an optical element which has one or two or more of said transfer surfaces on an optical mirror surface.

[Claim 9]

A method of molding the plastic molding according to any of claims 1 to 8, characterized by:

molding by an injection molding method which injects a resin into the cavity of said mold to fill the cavity with the resin.

[Claim 10]

A method of molding the plastic molding according to any of claims 1 to 8, characterized by:

generating a resin pressure in a resin within the cavity of said mold to transfer said transferred surface; and

subsequently generating local release shrinkage for the shape of said cavity to form said imperfect transfer portion in a concave shape.

[Claim 11]

A method of molding the plastic molding according to any of claims 1 to 8, characterized by:

generating a resin pressure in a resin within the cavity of said mold to transfer said transferred surface; and

subsequently releasing the resin pressure locally for the shape of said cavity to form said imperfect transfer portion in a convex shape.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[Technical Field Pertinent to the Invention]

The present invention relates to plastic moldings and a method of molding the same which can accurately mold plastic moldings, for example, for applications in optical scanning systems for laser-based digital copiers, laser printers, facsimile apparatus and the like, optical devices such as video cameras, and the like, particularly, thick plastic lenses, plastic mirrors or the like having high accurate mirror surfaces in thickness-varying shape.

[0002]

[Prior Art]

Conventionally, optical elements such as rectangular lenses, mirrors and the like having a function of focusing a laser beam and a variety of correcting functions have been used in an optical writing unit of a laser-based digital copier, printer, facsimile apparatus and the like. In recent years, materials for these optical elements have been changed from glass to plastic in line with a requested reduction in the product cost. Also, for covering a plurality of functions with a minimum number of elements, the optical elements

are formed with aspherical mirror surfaces as well as spherical mirror surfaces. Moreover, lenses are often designed to have large thicknesses and thickness-varying shapes, which are not uniform in thickness, along the longitudinal direction.

[0003]

Even in a special shape, such a plastic molding can be manufactured in volume at a low cost by inserting a resin base material into a cavity of a die formed in the shape of the molding or by injecting a melted resin into the cavity which is filled with the melted resin.

[0004]

[Problems to be solved by the Invention]

In the conventional plastic moldings as mentioned above, a uniform resin pressure and a uniform resin temperature is desired within the cavity of the mold to accurately mold the plastic molding in a desired shape in a process of cooling down a melted resin material within the cavity. However, depending on the shape of a particular molding, for example, a lens having a thickness-varying shape may experience a difference in volume shrinkage amount due to a resin cooling speed which differs from one location to another due to the varying thickness of the lens, resulting in a exacerbated shape accuracy and a sink in a thicker region of the lens. For example, for molding a thick plastic lens 10 having a varying thickness, a sink 14 is formed irrespective of mirror surfaces (transfer surfaces) 11, 12 and a side surface (non-transfer surface) 13, as illustrated in Fig. 8.

[0005]

To solve this problem, in an injection molding method that fills a melted resin in a cavity of a mold which is filled with the melted resin, when the melted resin is injected at a higher pressure to increase the amount of filled resin, a resulting plastic molding suffers from

a larger internal distortion, particularly, in a smaller thickness region when a thick lens having a varying thickness is concerned, possibly adversely affecting the optical characteristics and the like.

[0006]

Specifically, when the melted resin is injected at a lower pressure to reduce the amount of filled resin in order to reduce the internal distortion, a sink can be formed in a thicker region. On the other hand, when the melted resin is injected at a higher pressure to increase the amount of filled resin, the internal distortion can grow in a thinner region. To address this problem, a so-called injection compression molding method is practiced for ensuring the shape accuracy by using a cavity formed with an insert movable in a mold. Specifically, the insert is advanced in response to a difference in the volume shrinkage associated with cooling of the filled resin, for example, the volume shrinkage produced at every location in the longitudinal direction, resulting from a varying thickness of a lens, to compensate the pressure to apply a uniform pressure.

[0007]

However, even this injection compression molding method experiences difficulties in accurately moving the insert, and may in some cases fail to ensure the shape accuracy due to a sink formed in a portion of a mirror surface. From this fact, researches have been made to eliminate shortcomings of the injection molding method and injection compression molding method. For example, as disclosed in Laid-open Japanese Patent Applications Nos. 2-175115 and 6-30497, a molding method has been proposed for forming a sink except for a transfer surface.

[0008]

However, even this molding method, if applied as it is to the

manufacturing of plastic lenses having a varying thickness, a large thickness, a large diameter, and a profile, a sink is formed on a thinner region adjacent to a transfer surface due to a difference in cooling speed, possibly resulting in a remaining resin internal pressure and internal distortion in a thinner region to exacerbate the shape accuracy and increase birefringence to degrade the optical accuracy of the lens.

[0009]

It is therefore an object of the present invention to provide a plastic molding equivalent to a thin molding in production cost and accuracy, even if it is made thick or in a thickness-varying shape, by creating a concave shape or a convex shape formed by an imperfect transfer at positions in regions in which the occurrence of the resin internal pressure and internal distortion is controlled, except for transfer surfaces, to eliminate the remaining resin internal pressure and internal distortion.

[0010]

[Means for Solving Problem]

To solve the problems, the present invention provides a plastic molding formed with a transfer surface by generating a resin pressure in a resin within a cavity of a mold having one or two transferred surfaces to transfer the transferred surfaces to the plastic molding. The plastic molding is characterized by comprising an imperfect transfer portions formed in a concave shape or in a convex shape by imperfectly transferring the shape of the cavity of the mold into at least one or two or more regions prone to a resin internal pressure and an internal distortion.

[0011]

In this structure, even in a region prone to the resin internal

pressure and internal distortion, the imperfect transfer portion is formed in a concave shape or in a convex shape in accordance with the resin pressure by the imperfect transfer of the shape of the cavity of the mold to prevent the resin internal pressure and internal distortion. Therefore, only by forming the imperfect transfer portion, the optical accuracy and the like can be readily ensured together with a transfer surface in a portion which requires the shape accuracy.

[0012]

The imperfect transfer portion can be formed in a region other than the transfer surface to ensure the shape accuracy of the entire transfer surface. Also, when the imperfect transfer portion is formed in a surface extended from the transfer surface, the shape accuracy can be ensured as well even if a portion of the surface falls within the transfer surface. In addition, the imperfect transfer portion may be formed even in a region of the transfer surface which does not require the shape accuracy. When the imperfect transfer portion has the edge formed along the flat surface or curved shape of the transfer surface, it is possible to uniformly prevent the resin internal pressure and internal distortion in a portion which extends to form part of the transfer surface. Alternatively, when the edge is formed conformal to the shape of the transfer surfaces in a region sandwiched by the transfer surfaces, it is possible to prevent, with its large area, the resin internal pressure and internal distortion, thereby further improving the shape accuracy, the optical accuracy and the like. Likewise, when two or more imperfect transfer portions are formed on the same surface other than the transfer surface, it is possible to uniformly prevent the resin internal pressure and internal distortion and locally prevent the resin internal pressure and internal distortion with the portions of large areas, thereby

further improving the shape accuracy, the optical accuracy and the like.

[0013]

It is possible to fabricate a plastic molding such as an optical element which excels in the shape accuracy and the optical accuracy by forming one or two or more transfer surfaces on an optical mirror surface. This plastic molding may be molded, for example, by injecting a resin into a cavity of a mold for forming the imperfect transfer portion by an injection molding method. For example, after generating a resin pressure in a resin within the cavity of the mold to transfer the transferred surface, local release shrinkage can be generated for the shape of the cavity to form the imperfect transfer portion in a concave shape, or the resin pressure can be locally released for the shape of the cavity to form the imperfect transfer portion in a convex shape.

[0014]

[Embodiments of the Invention]

In the following, the present invention will be described with reference to the drawings. Figs. 1 and 2 are diagrams illustrating a first embodiment of a plastic molding and a method of molding the same in accordance with the present invention. Fig. 1 is a perspective view illustrating the plastic molding, and Fig. 2 is a cross-sectional view illustrating a mold for implementing the molding method. This embodiment corresponds to the inventions described in claims 1, 2, and 8 to 11.

[0015]

In Fig. 1, reference numeral 10 designates a plastic lens (optical element). The plastic lens 10 is fabricated in a thickness-varying shape having an optical mirror surface (transfer surface) 11 curved

to be thicker in a central region on one surface thereof; a flat mirror surface 12 opposite to the optical mirror surface 11; and a side surface (non-transfer surface) 13 between the mirror surfaces 11, 12. The plastic lens 10 is formed with a concave or convex imperfect transfer portion 21 on the side surface 13 by an injection molding method using a mold 30 illustrated in Fig. 2.

[0016]

The plastic lens (plastic molding according to the present invention) 10 is not limited to the injection molding method but may be fabricated by a variety of plastic molding methods such as a compression molding method, a blow molding method, and the like. However, the injection molding method can readily create the imperfect transfer portion by an isolation of a resin from the cavity wall of the mold at an arbitrary position to reduce an internal distortion while maintaining a condition for forming a highly accurate transfer surface, and efficiently produce a thick molding having a varying thickness, from the fact that a melted resin within the cavity is solidified in a surface region immediately after it is injected into the cavity for filling, while it remains melted in an internal region, as will be described later. From the foregoing, the injection molding method is preferably selected as is the case with this embodiment.

[0017]

As illustrated in Fig. 2, the mold 30 defines a cavity 31 by a pair of an upper and a lower mold half. The cavity 31 can be opened and closed. A melted resin 100 is injected into the cavity 31. The cavity 31 is defined by non-transfer surfaces 32a, 33a, and side walls 34, 35 formed on mirror surfaces of an upper and a lower fixed insert 32, 33. A movable insert 36 is disposed internal to the side wall 34 in a cross-sectional shape corresponding to the imperfect transfer

portion 21 of the plastic lens 10. The movable insert 36 is made movable deep into and back from the cavity 31.

[0018]

The mold 30 is adapted to mold the plastic lens 10 by an injection molding method by automatically or manually opening and closing the mold 30 and controlling movements of the movable insert 36. As illustrated in Fig. 2(a), like a typical injection molding method, after the melted resin 100 is injected into the cavity 31, the movable insert 36 is retracted within the cavity 31 in a direction away from the resin 100, as illustrated in Fig. 2(b), when the resin pressure reaches a predetermined pressure in the progress of the solidification of the melted resin 100 within the cavity 31, thereby defining a gap S between the side wall of the movable insert 36 and the resin 100.

[0019]

In this way, the melted resin 100 injected into and filled in the cavity 31 of the mold 30 generates the resin pressure against the wall surface of the cavity 31 to bring the mirror surfaces 32a, 33a into close contact with the side walls 34, 35 during the solidification. After the lapse of a fixed time, the movable insert 36 is retracted so that its side wall is separated, causing deformation of a corresponding portion in accordance with the resin pressure. In this event, the resin 100 is formed into a convex shape in which edges are similar to the side walls of the movable insert 36 by a locally released pressure, if the resin pressure still remains. Alternatively, the resin 100 is formed into a concave shape due to local release shrinkage if the resin pressure is below the atmospheric pressure. The resulting plastic lens 10 is formed with the imperfect transfer portion 21.

[0020]

The portion of the resin 100 from which the side wall of the movable insert 36 is separated is a free surface which can be readily deformed. In addition, since heat hardly escapes from the movable insert 36, this portion of the resin 100 is hotter than the portion of the resin 100 in contact with the wall of the cavity 31, preferentially causing movement and shrinkage of the resin, resulting in the concave shape. Thus, even if the resin 100 is formed into a convex shape immediately after the release, the resin 100 does not necessarily end up with the convex shape. Particularly, a filling pressure of the melted resin 100 into the cavity 31 must be reduced to such an extent that the internal distortion will not affect the optical performance. Therefore, if the resin 100 is molded at lower temperatures, a convex shape, i.e., a sink is preferentially formed in the separated portion due to the shrinkage during the cooling.

[0021]

Therefore, the plastic lens 10 has the mirror surfaces 11, 12 formed in a required shape accuracy and excels in the optical accuracy without the remaining resin internal pressure or internal distortion only by forming the imperfect transfer portion 21 which is formed into a convex shape or a concave shape depending on the resin pressure in a portion corresponding to the side wall of the movable insert 36 by the injection molding method using the mold 30.

[0022]

The imperfect transfer portion 21 can be entirely formed with a high accuracy by positioning it on a side surface different from the mirror surfaces 11, 12. In addition, by using the inner region of the side wall 34 defining the cavity 31 of the mold 30 to form the side wall of the movable insert 36, the imperfect transfer portion 21 will not have its edges at positions which are adjacent to the

mirror surfaces 11, 12, so that no resin 100 will introduce over the mirror surfaces 11, 12. Thus, the resulting plastic lens 10 has a low distortion and a high shape accuracy.

[0023]

Resin materials suitable for fabricating the plastic lens can be non-crystal resin, the softening temperature of which is equal to its glass transition temperature, for example, polymethacrylate resin, polycarbonate resin, alicyclic acrylic resin, cyclic polyolephine copolymer (for example, Zeonex manufactured by Nippon Zeon Corporation), and the like if the transparency is required. For applications other than optical elements, crystalline resin, the softening temperature of which is equal to its melting temperature, can be used.

[0024]

As described above, in this embodiment, the plastic lens 10 provides a high shape accuracy and optical accuracy without the remaining resin internal pressure or internal distortion, even if the plastic lens 10 is made thick and in a thickness-varying shape, by virtue of the imperfect transfer portion 21 formed therein. In addition, the plastic lens 10 can be fabricated at a production cost equivalent to that of a thin molding by the injection molding method which is low in manufacturing cost and suitable for mass production.

[0025]

Next, Fig. 3 is a diagram illustrating a second embodiment of the plastic molding and a method of molding the same according to the present invention, and is a perspective view illustrating the plastic molding molded by the molding method described in the foregoing embodiment. This embodiment corresponds to the inventions described in claims 1 to 3, and 6 to 11. In this embodiment, since the plastic

molding is molded substantially in a manner similar to the foregoing embodiment, the molding method will be described in brief with reference again to Fig. 2 (the same applies to embodiments described later).

[0026]

In Fig. 3, the plastic lens 10 according to this embodiment has mirror surfaces 11, 12 and a side surface 13, and the side surface 13 is formed with an attachment reference surface (transfer surface) 15 at the center in the longitudinal direction, and convex or concave imperfect transfer portions 22 in thinner regions on both sides of the attachment reference surface 15, instead of the imperfect transfer portion 21. By the injection molding method using the mold 30, this plastic lens 10 is formed with the attachment reference surface 15 by closely transferring the transferred surface of the fixed insert provided internal to the side wall 34 which defines the cavity 31, and is also formed with the imperfect transfer portions 22 in a convex shape due to a locally released pressure or in a concave shape due to a local release shrinkage, depending on the resin pressure, by movable inserts disposed on both sides of the fixed insert which are retracted during the solidification of a surface region of the melted resin 100 injected into the cavity 31 during the cooling and at a predetermined resin pressure to define a gap S.

[0027]

Therefore, the plastic lens 10 can be accurately formed with the attachment reference surface 15 together with the transfer surfaces 11, 12 by the imperfect transfer portion 21, so that the accuracy can be ensured as well for attachment by providing the attachment reference surface 15 on the same side surface (extended surface) 13 between the imperfect transfer portions 22, whereas the conventional

injection molding method, which induces a sink, cannot ensure the shape accuracy due to the entire surface deformed into a convex shape, thereby failing to fix using that surface as an attachment reference.

[0028]

Since the imperfect transfer portions 22 are positioned in thinner (smaller thickness) regions of the plastic lens 10, the resin internal pressure or internal distortion will not remain as a whole, and the resin internal pressure and internal distortion can be locally prevented in the thinner regions. Also, since the imperfect transfer portions 22 are formed at two locations, a larger area can be provided for the deformation into the convex or concave shape, and its height and depth, which can affect the light transmitting region, can be reduced.

[0029]

As described above, in this embodiment, the plastic lens 10 can effectively mitigate the resin internal pressure and internal distortion in the thinner regions to further improve the optical accuracy while ensuring the accuracy for attachment by the high shape accuracy of the attachment reference surface 15 by providing the imperfect transfer portions 22 even if it has the attachment reference surface 15 on the side surface 13, in addition to the operational effects of the embodiment.

[0030]

It should be understood that as another implementation of this embodiment, the present invention can be applied to a plastic molding which need not be formed with the attachment reference surface 15, as illustrated in Fig. 4. Next, Fig. 5 is a diagram illustrating a third embodiment of the plastic molding and the method of molding the same according to the present invention, and is a perspective

view illustrating a plastic molding which is molded by the molding method described in the foregoing embodiment. This embodiment corresponds to the inventions described in claims, 1, 2 and 6 to 11.

[0031]

In Fig. 5, the plastic lens 10 according to this embodiment has mirror surfaces 11, 12 and a side surface 13. The side surface 13 is formed with a larger circular concave or convex imperfect transfer portion 23 at the center in the longitudinal direction, and smaller circular concave or convex imperfect transfer portions 24 in thinner regions on both sides of the imperfect transfer portion 23, instead of the imperfect transfer portion 21.

[0032]

By an injection molding method using the mold 30, this plastic lens 10 is formed with the imperfect transfer portions 23, 24 in convex shape due to a locally released pressure or in a concave shape due to a local release shrinkage, depending on the resin pressure, by three movable inserts disposed internal to the side wall 34, which defines the cavity 31. The three movable inserts are retracted during the solidification of a surface region of the melted resin 100 injected into the cavity 31 during the cooling and at a predetermined resin pressure to define a gap S.

[0033]

Therefore, the plastic lens 10 provides a larger area for the deformation into the convex or concave shape, with the imperfect transfer portions 23, 24, to reduce its height and depth which can affect the light transmitting region, and prevents the resin internal pressure or internal distortion from remaining as a whole, and can prevent the resin internal pressure and internal distortion from being locally generated in the thinner regions with the imperfect transfer

portion 23.

[0034]

While the imperfect transfer portions 23, 24 are not particularly limited in shape, their edges may be rounded to advantageously facilitate the working of the mold. In this manner, this embodiment can more effectively mitigate the resin internal pressure and internal distortion to further improve the optical accuracy by forming the imperfect transfer portion 23 of a larger diameter, in addition to the imperfect transfer portions 24 in the thinner regions, in addition to the operational effects of the aforementioned embodiment.

[0035]

Next, Fig. 6 is a diagram illustrating a fourth embodiment of the plastic molding and the method of molding the same according to the present invention, and is a perspective view illustrating a plastic molding molded by the molding method described in the foregoing embodiment. This embodiment corresponds to the inventions described in claims 1, 2, 4 to 6, and 8 to 11. In Fig. 6, the plastic lens 10 according to this embodiment has mirror surfaces 11, 12 and a side surface 13. The side surface 13 sandwiched by the mirror surfaces 11, 12 is formed with an imperfect transfer portion 25 in a similar shape to the plastic lens 10 which has the edge formed along the curved mirror surface 11 and the flat mirror surface 12, instead of the imperfect transfer portion 21.

[0036]

By the injection molding method using the mold 30, this plastic lens 10 is formed with the imperfect transfer portion 25 in a convex shape due to a locally released pressure or in a concave shape due to a local release shrinkage, depending on the resin pressure, by a movable insert, which has a similar cross-sectional shape, disposed

internal to the side wall 34 which defines the cavity 31. The movable insert is retracted during the solidification of a surface region of the melted resin 100 injected into the cavity 31 during the cooling and at a predetermined resin pressure to define a gap S.

[0037]

Therefore, the plastic lens 10 can provide a larger area which is deformed in the convex or concave shape, with the imperfect transfer portion 25, to reduce its height and depth which can affect the light transmitting region, prevent the resin internal pressure or internal distortion from remaining as a whole, and uniformly prevent the resin internal pressure and internal distortion in thinner regions. As described above, in this embodiment, the plastic lens 10 can more effectively mitigate the resin internal pressure and internal distortion by forming the imperfect transfer portion 25 larger in area than the imperfect ~~transfer~~ portions 21 - ~~24~~ to more improve the optical accuracy, in addition to the operational effects of the embodiment.

[0038]

Though not shown, in another implementation of this embodiment, for fabricating, for example, a large plastic lens 10, imperfect transfer portions may be formed along each of the curved and flat surfaces of the mirror surfaces 11, 12 (claim 4), wherein the imperfect transfer portion may be formed with the edge to ensure an area required to prevent a resin stress and internal distortion. In this structure, the resin stress and internal distortion can be effectively prevented, and uniform mirror surfaces 11, 12 can be formed in the longitudinal direction.

[0039]

[Effects of the Invention]

According to the present invention, the imperfect transfer portions formed in thinner regions which are prone to the resin internal pressure and internal distortion are molded in a concave shape or a convex shape depending on a resin pressure so as to imperfectly transfer the shape of the cavity in the mold, thereby making it possible to prevent the resin internal pressure and internal distortion from remaining in those regions, and to reduce the resin internal pressure and internal distortion in the thinner regions and the like, which have not been able to be reduced by conventional methods, even when the molding has, for example, a large thickness, a varying thickness, a large diameter, a different shape, or the like.

[0040]

It is therefore possible to readily provide a plastic molding which ensures the shape accuracy and the optical accuracy by setting imperfect transfer portions at arbitrary positions. The imperfect transfer portion can ensure the shape accuracy of the entire transfer surface when it is formed on a surface other than a transfer surface, and can have an assembly reference surface formed, for example, in a portion of the same surface extended from the transfer surface with a high accuracy to ensure the accuracy for assembling, when it is formed on the surface.

[0041]

The imperfect transfer portions, when having the edge formed along the shape of the transfer surface, or when formed in a large area conformal with the shape of the transfer surface, or when formed on the same surface in plural, can effectively mitigate the resin internal pressure and internal distortion in the portions to further improve the shape accuracy, the optical accuracy, and the like. In this way, for example, when an optical mirror surface is formed as a transfer

surface, an optical element which is required to have a low distortion and a highly accurate shape can be readily fabricated at a low cost.

[0042]

The imperfect transfer portions can be formed by an injection molding method which is low in the manufacturing cost and suitable for mass production. For example, the imperfect transfer portion can be formed in a convex shape by generating local release shrinkage for the shape of the cavity, or in a convex shape by locally releasing the resin pressure for the shape of the cavity, for example, after the transferred surface has been transferred with the resin pressure generated in the resin within the cavity of the mold.

[0043]

As a result, only with the feature for forming the imperfect transfer portions, it is possible to provide a highly accurate plastic molding at a production cost equivalent to that of a thin molding.

[Brief Description of Drawings]

[Fig. 1]

A diagram illustrating a first embodiment of a plastic molding and a method of molding the same according to the present invention, and a perspective view illustrating the plastic molding.

[Fig. 2]

A cross-sectional view illustrating a mold for implementing the molding method.

[Fig. 3]

A diagram illustrating a second embodiment of the plastic molding and the method of molding the same according to the present invention, and a perspective view illustrating the plastic molding.

[Fig. 4]

A perspective view of a plastic molding illustrating another

implementation.

[Fig. 5]

A diagram illustrating a third embodiment of the plastic molding and the method of molding the same according to the present invention, and a perspective view illustrating the plastic molding.

[Fig. 6]

A diagram illustrating a fourth embodiment of the plastic molding and the method of molding the same according to the present invention, and a perspective view illustrating the plastic molding.

[Fig. 7]

A perspective view illustrating a conventional plastic molding.

[Fig. 8]

A perspective view illustrating a plastic molding for describing a problem of the conventional plastic molding.

[Description of Reference Numerals]

10 Plastic Lens (Plastic Molding)

11, 12 Mirror Surfaces (Transfer Surfaces)

13 Side Surface

15 Attachment Reference Surface (Transfer Surface)

21 - 25 Imperfect Transfer Portions

30 Mold

31 Cavity

32, 33 Fixed Inserts

32a, 33a Transferred Surfaces

34, 35 Side Walls

36 Movable Insert

[Name of Document] Abstract

[Abstract]

[Problem to be solved]

The present invention relates to a plastic molding and a method of molding the same, and has an object to provide a highly accurate plastic molding at a production cost equivalent to that of a thin molding, even when it has a large thickness or a thickness-varying shape, by reducing a remaining resin internal pressure and internal distortion through imperfect transfer.

[Solution]

A plastic lens 10 having mirror surfaces 11, 12 transferred from transferred surfaces 32a, 33a of a mold 30 by an injection molding method is formed with an imperfect transfer portion 31 on a side surface 13 in a concave shape or in a convex shape by retracting a movable insert 3 of the mold 30 to imperfectly transfer the shape of a cavity 31.

FIG. 1
【図1】

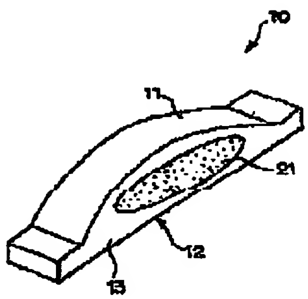


FIG. 2
【図2】

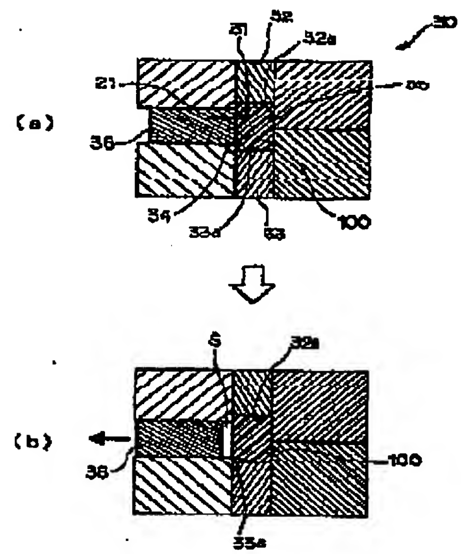
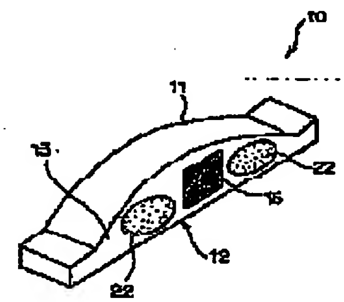
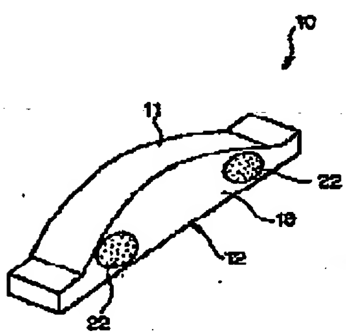


FIG. 3
【図3】



【図4】
FIG. 4



【図5】
FIG. 5

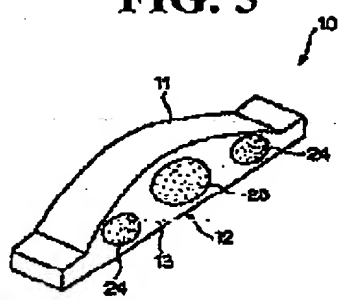
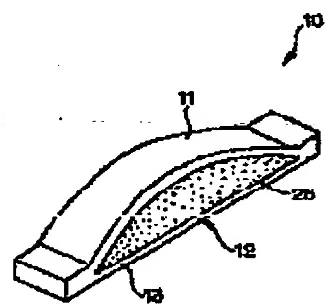
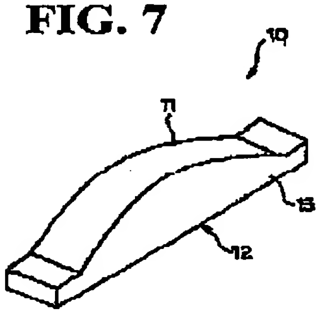


FIG. 6
【図6】



【図7】
FIG. 7



【図8】
FIG. 8